NATOPS
Situational Training

Capt Johnson
NATOPS Officer

- Power Required exceeds Power Available
- Mountain and Rough Terrain Flying
- CRM
  - Situational Awareness

Power Required exceeds Power Available

YM

14.36 POWER REQUIRED EXCEEDS POWER AVAILABLE (SETTLING WITH POWER)

Indications:

Uncommanded descent with torque at maximum allowed.

Rotor droop.

Loss of tail rotor effectiveness.

Procedures:

*1. Collective — Adjust as required to maintain N_r in operating range.

*2. RPM switch — Full increase.

*3. Airspeed — Increase/decrease to 50 KIAS (minimum power required airspeed).

*4. Angle of bank — Level wings.

*5. Jettison — As required.

If impact is imminent:

*6. Level the aircraft to conform to terrain.

*7. Cushion the landing.

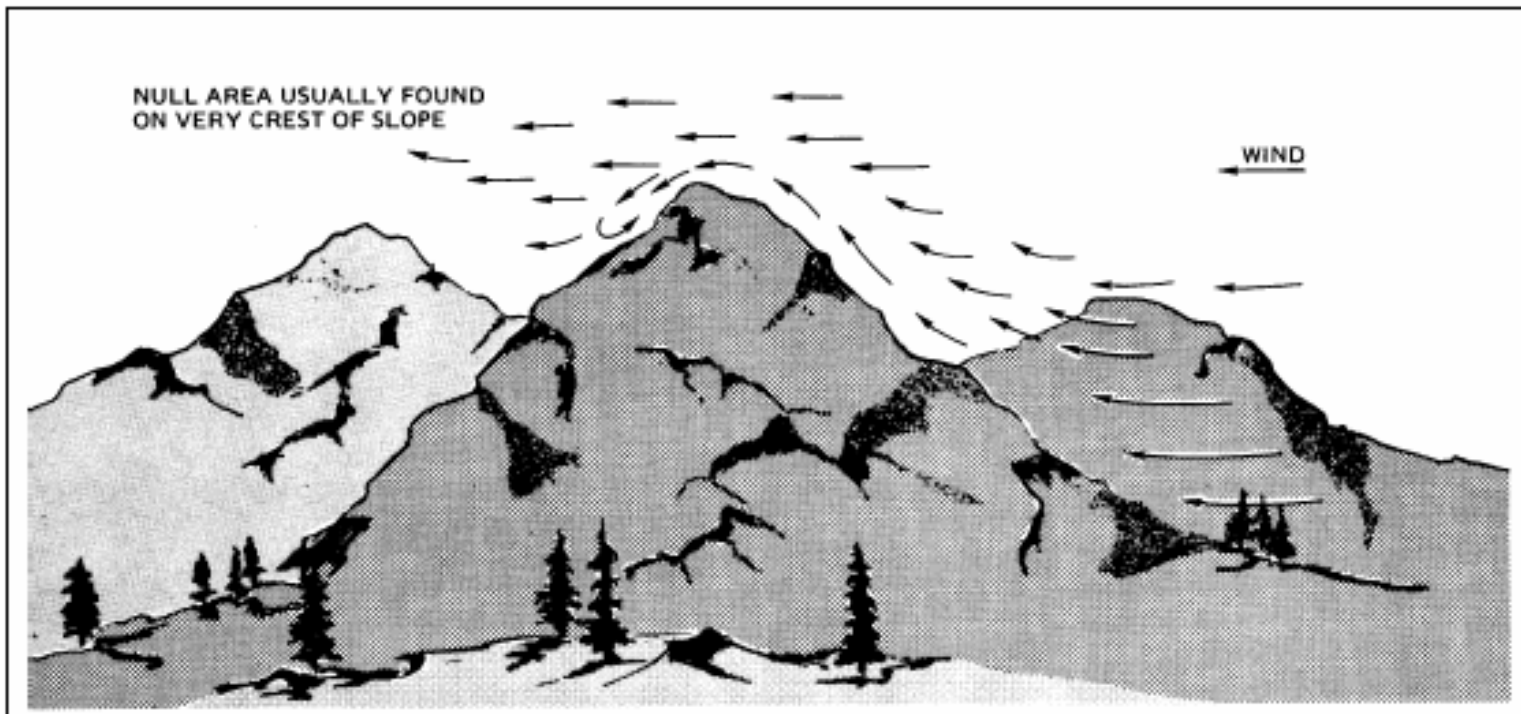
Factors that can cause or aggravate this situation are:

1. High g loading (e.g., level turns).
2. High gross weight.
3. High density altitude.
4. Rapid maneuvering (e.g., quickstops).
5. Spool-up time from lower power settings to high power settings (i.e., power pull at the completion of a power recovery autorotation).
6. Loss of wind effect (e.g., descending below a tree line during a confined area landing).
7. Change of wind direction (e.g., during lower altitude/low airspeed flight terrain following).
8. Loss of ground effect (e.g., transmitting to forward from the deck of a ship with a heavy internal load).

Pilots can avoid power required exceeding power available by:

1. Preflight planning to calculate expected aircraft performance.
2. Avoiding excessive maneuvering, particularly during high/hot and/or high gross weight/marginal power available situations.
3. Avoiding high descent rates at low altitudes, which will require large power inputs to arrest the descent of the helicopter.
4. Avoiding downwind landings and takeoffs.
5. Maintaining awareness of windspeed and direction, especially during low altitude/low airspeed maneuvers.
6. Maintaining awareness of the factors leading to power required exceeding power available and the associated effects on aircraft and performance.

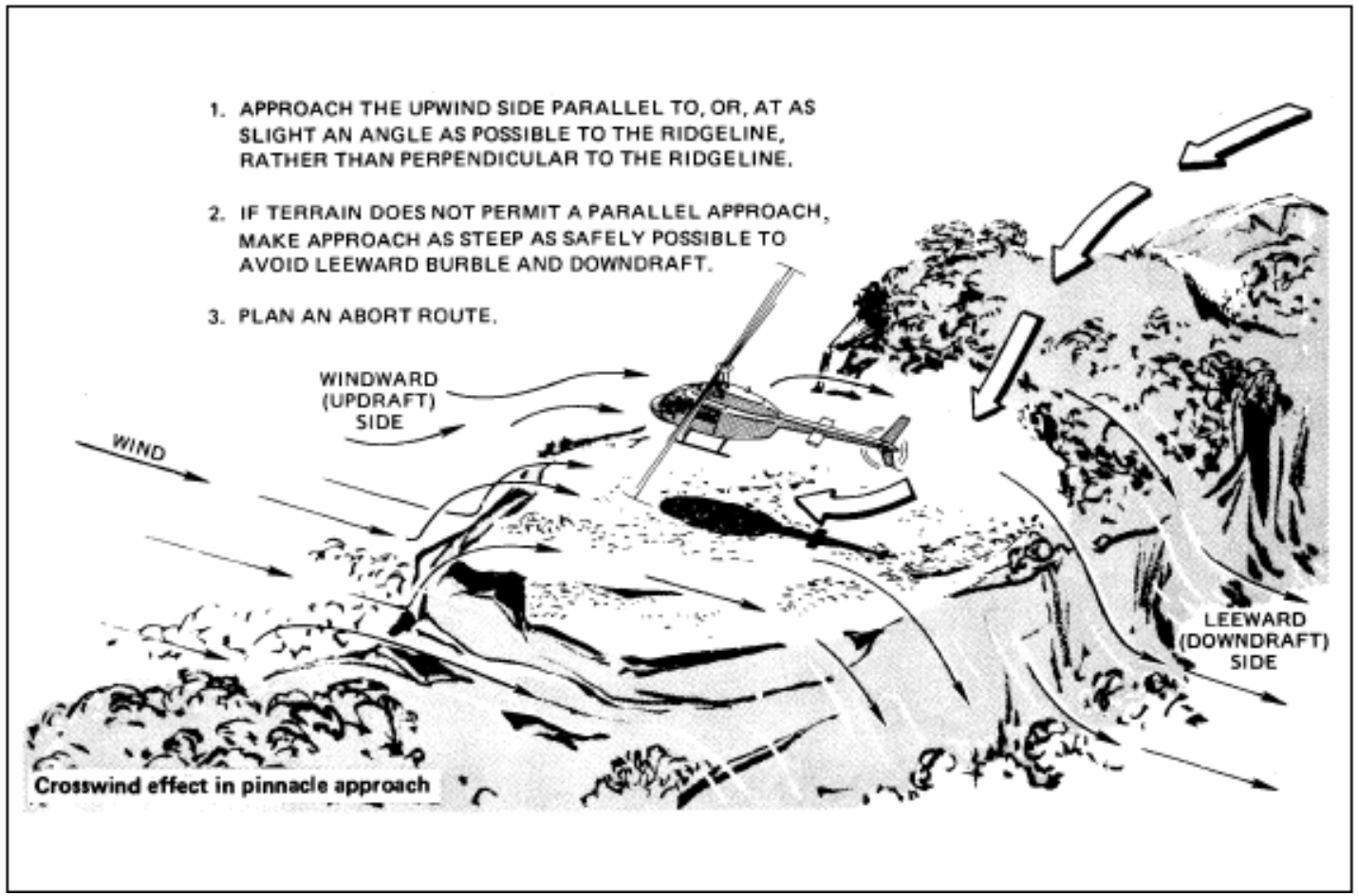
Mountain and Rough Terrain Flying

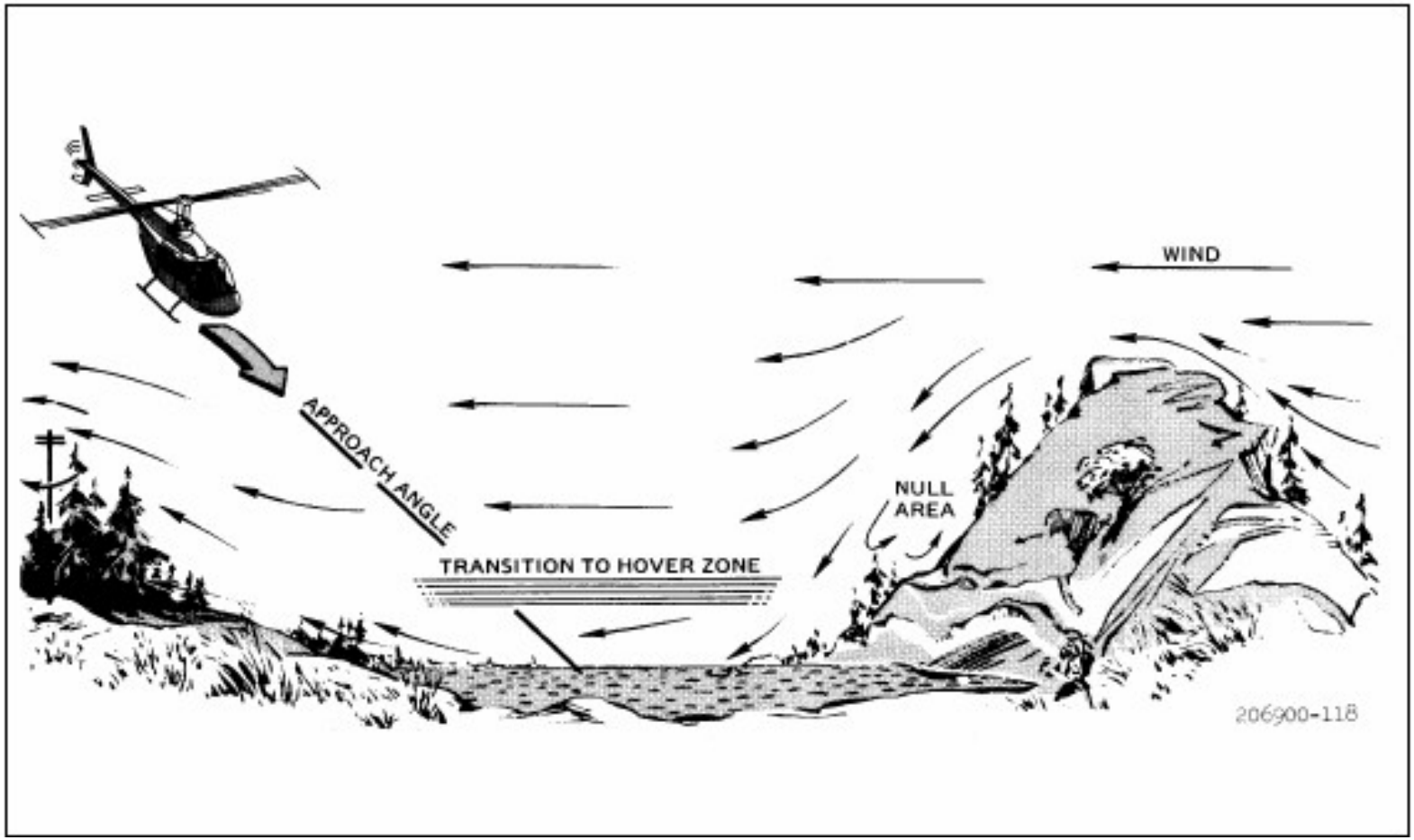


UPDRAFTS WILL EXTEND ABOVE THE SURFACE FURTHER THAN THE TURBULENCE DEPENDING ON WIND SPEED

IN VERY STRONG WIND CONDITIONS AND/OR VERY STEEP SLOPES, THE TURBULENCE WILL BE FOUND FORWARD OF THE SLOPE IN CLEAR AIR

206900-119-2


1. APPROACH THE UPWIND SIDE PARALLEL TO, OR, AT AS SLIGHT AN ANGLE AS POSSIBLE TO THE RIDGELINE, RATHER THAN PERPENDICULAR TO THE RIDGELINE.
2. IF TERRAIN DOES NOT PERMIT A PARALLEL APPROACH, MAKE APPROACH AS STEEP AS SAFELY POSSIBLE TO AVOID LEEWARD BURBLE AND DOWNDRAFT.
3. PLAN AN ABORT ROUTE.
WINDWARD (UPDRAFT) SIDE
WIND
LEEWARD (DOWNDRAFT) SIDE
Crosswind effect in pinnacle approach


WIND
APPROACH ANGLE
NULL AREA
TRANSITION TO HOVER ZONE
206900-118

Summary for mountain and rough terrain flying:

- Make a continuous check of wind direction and estimated velocity
- Plan approach so abort can me made downhill
- Make at least one high and one low pas prior to landing in a strange area
- Determine ability to HOGE prior to landing
- Fly as smoothly as possible and avoid steep turns
- Avoid downdrafts on leeward slopes
- Approaches to ridges should be parallel to ridge
- Avoid high rates of descent when approaching landing sites

Case Study

NTSB Identification: **LAX04FA137**.
14 CFR Part 91: General Aviation
Accident occurred Monday, February 16, 2004 in Jean, NV
Probable Cause Approval Date: 7/7/2005
Aircraft: Piper PA-28-161, registration: N9199Z
Injuries: 2 Fatal.

The airplane collided with mountainous desert terrain in a box canyon during low altitude flight maneuvering. The pilot, a military helicopter pilot, was checked out in the airplane 4 days prior to the accident. He held approximately 500 hours total flight time and 150 hours flight time in airplanes. He and his passenger arrived at their destination 2 days prior to the accident. After fueling the airplane, they departed for the return flight home. Radar plots ending about 17 miles from the accident site indicated that the airplane maintained an approximate mean sea level (msl) altitude of 3,500 feet (about 100 feet above ground level) as it flew in a southerly direction, with the surrounding terrain rising to 4,400 feet msl at a rate of increase per mile that was about twice the climb capability of the airplane.

The wreckage site was located in a canyon, at an elevation of 3,780 feet msl. The top of the ridges behind the accident site rose to 4,400 feet msl. The toxicological report for the pilot was positive for ethanol, but the state of the specimens evaluated made it impossible to determine whether the ethanol was produced post-mortem or was a result of ingestion of alcohol. No mechanical or control anomalies were found with either the airframe or engine during the post-accident examinations.

The National Transportation Safety Board determines the probable cause(s) of this accident as follows:

the pilot's failure to maintain adequate clearance with the rising terrain, while maneuvering at low altitude in a mountainous area.

Case Study

NTSB Identification: **LAX04LA281**.
14 CFR Part 91: General Aviation
Accident occurred Monday, July 26, 2004 in Little Valley, CA
Probable Cause Approval Date: 10/27/2005
Aircraft: Bell 206B, registration: N549W
Injuries: 2 Serious, 1 Minor.

The helicopter collided with trees and terrain while the pilot maneuvered at a low altitude, under high density altitude conditions, and over rising mountainous terrain. The purpose of the aerial survey flight was to provide a California Department of Forestry passenger with an aerial mapping opportunity around active fire areas in the Lassen National Park. The pilot indicated that his specific mission on the flight was to maneuver the helicopter over a route that would provide the front seat passenger an opportunity to accurately mark global positioning satellite (GPS) waypoints around the fire area. Initially, the pilot flew at 6,500 feet mean sea level (msl), but when the passenger started marking waypoints, the pilot descended to 5,500 feet msl. The pilot further indicated that during the flight he made several turns. Just prior to the crash, he flew in a southerly, and then a northerly direction. When he next turned, to an east-southeasterly direction, he raised the collective, observed his proximity to the fire line, and directed his attention to a hill that he was approaching. The pilot indicated that he had expected to be higher than the top of the hill, but he was lower. At this time, despite his efforts to increase altitude, the helicopter impacted trees and terrain.

According to ground-based witnesses, the helicopter had been maneuvering between 50 and 75 feet above ground level, in a downwind direction, over 5,100-foot mean sea level upsloping terrain, toward the crest of the mountain. The surface wind was from the north-northeast, about 10 knots. The temperature was almost 90 degrees Fahrenheit. The witnesses further reported that the helicopter's engine was operating until it impacted trees, about 20 feet beneath the mountain crest.

The National Transportation Safety Board determines the probable cause(s) of this accident as follows:

the pilot's failure to maintain an adequate clearance from objects and terrain while maneuvering at low altitude. Factors in the accident were the high, rising terrain, and the high density altitude.

CRM

a. Safety of flight. The nonflying pilot will monitor performance instruments, question anything exceeding the following parameters, and be prepared to assume the controls:

(1) Angle of bank in excess of 30°.

(2) Rate of descent or climb exceeding 1,000 fpm (Feet per Minute).

(3) Airspeed errors in excess of 10 KIAS.

(4) Altitude errors in excess of 100 feet.

(5) Heading errors in excess of 10°.

(6) Vertigo/disorientation.

b. During approaches:

(1) The nonflying pilot will follow progress of the approach on his approach plate.

(2) The nonflying pilot will assist with timing as required.

(3) The nonflying pilot will maintain a lookout for the airport:

(a) When the airport is positively in sight, report that fact with the words, "AIRPORT IN SIGHT."

(b) Control will/will not be transferred and, until landing is assured, the nonflying pilot will maintain an instrument scan.

c. During missed approaches, the nonflying pilot will read missed approach instructions and assist the flying pilot as directed.

Situational Awareness

Situational awareness is the accurate perception of the critical factors and conditions affecting the immediate environment at a specific time. This includes what has happened in the past and how it affects what is happening in the present; and how it may affect what will happen in the future.

Situational Awareness

Every individual has a different level of SA depending upon his/her own perception of reality.

The situational awareness level of the crew is determined by the level of the person in charge of the crew. This is contrary to the belief that the crew's level of awareness is the sum of that of the individual crewmembers.

Symptoms of Situational Awareness Loss:

(1) Fixation.

(2) Ambiguity - facts don't match perceptions.

(3) Complacency - boredom with situation.

(4) Gut Feeling/Confusion - your subconscious is sending you a signal.

(5) Poor Communications - difficulty in getting point across or understanding.

(6) Failure to meet targets - unexplained failure to accomplish tasks.

(7) Using improper procedures - the leading cause of accidents.

(8) Unresolved discrepancies - problems forgotten or ignored.

(9) No one flying the aircraft - the entire crew is involved in other tasks.

(10) Distraction - one particular detail focused on at the expense of others that are equally important or more important.

Maintaining Situational Awareness:

(1) Experience and training - Only through practicing basic skills can one cope with routine situations as well as new and/or unexpected events.

(2) Personal health - A healthy body with all of the senses operating at their optimum can detect subtle changes to every situation and process information effectively.

(3) Assertiveness - There must be a sense of responsibility to speak out when action by another crewmember is questionable or not understood.

(4) Spatial orientation - It is important to know what is going on around you at all times.

Questions?